OCS Report
MMS 2001-092

Resource Evaluation
Program Report

Geological & Geophysical Data Acquisition

Outer Continental Shelf Through 2000

U.S. Department of the Interior
Minerals Management Service
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U.S. Department of the Interior
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Acronyms and Abbreviations

CDP	Common depth point
CFR	Code of Federal Regulations
COST	Continental Offshore Stratigraphic Test
DOI	Department of the Interior
DST	Deep stratigraphic test (well)
FY	Fiscal Year
G&G	Geological and geophysical
GOM	Gulf of Mexico
GRAV	Gravity data
HRD	High-resolution seismic data
MAG	Magnetic data
MMS	Minerals Management Service
OCS	Outer Continental Shelf
OCSLA	Outer Continental Shelf Lands Act
RE	Resource Evaluation
REP	Resource Evaluation Program
SEG	Society of Exploration Geophysicists
2-D	Two-dimensional seismic data
3-D	Three-dimensional seismic data
4-D	Four-dimensional seismic data

Introduction

This report addresses the general role of the MMS Resource Evaluation Program (REP) in geological and geophysical (G&G) data acquisition and permitting activities.

The Minerals Management Service (MMS) administers the provisions of the Outer Continental Shelf Lands Act (OCSLA) through regulations found at Title 30 of the Code of Federal Regulations (CFR). The regulations govern permitting, data acquisitions and release, leasing, and postlease operations on the Outer Continental Shelf (OCS). The OCS is divided into planning areas for administrative purposes as shown in figure 1.

With regard to the REP, authority has been vested in the Secretary of the Interior under 30 CFR Part 251 to regulate prelease G&G exploration for oil, gas, and sulphur resources on the OCS. Part 251 applies not only to G&G exploration but to scientific research as well. The purpose of these regulations is to prescribe (1) when a permit or the filing of a notice is required to conduct G&G activities on the OCS and (2) operating procedures for conducting exploration, as well as requirements for disclosing data and information, conditions for reimbursing permittees for certain costs, and other conditions under which exploration shall be conducted. Similar regulations addressing prelease prospecting activities for minerals other than oil, gas, or sulphur can be found in 30 CFR Part 280.

In this report, the totals for permits issued, mileage acquired, and expenditures reflect the overall trends of oil and gas pricing, limitations of areas due to offshore moratoria, and the shift of industry emphasis to foreign theatres. Also reflected is the trend among the MMS Regions with diminished leasing activity to obtain digital tapes of in-house analog data in preparation for data release commencing with the expiration of proprietary terms in 2001 as discussed by Fulton (1998).

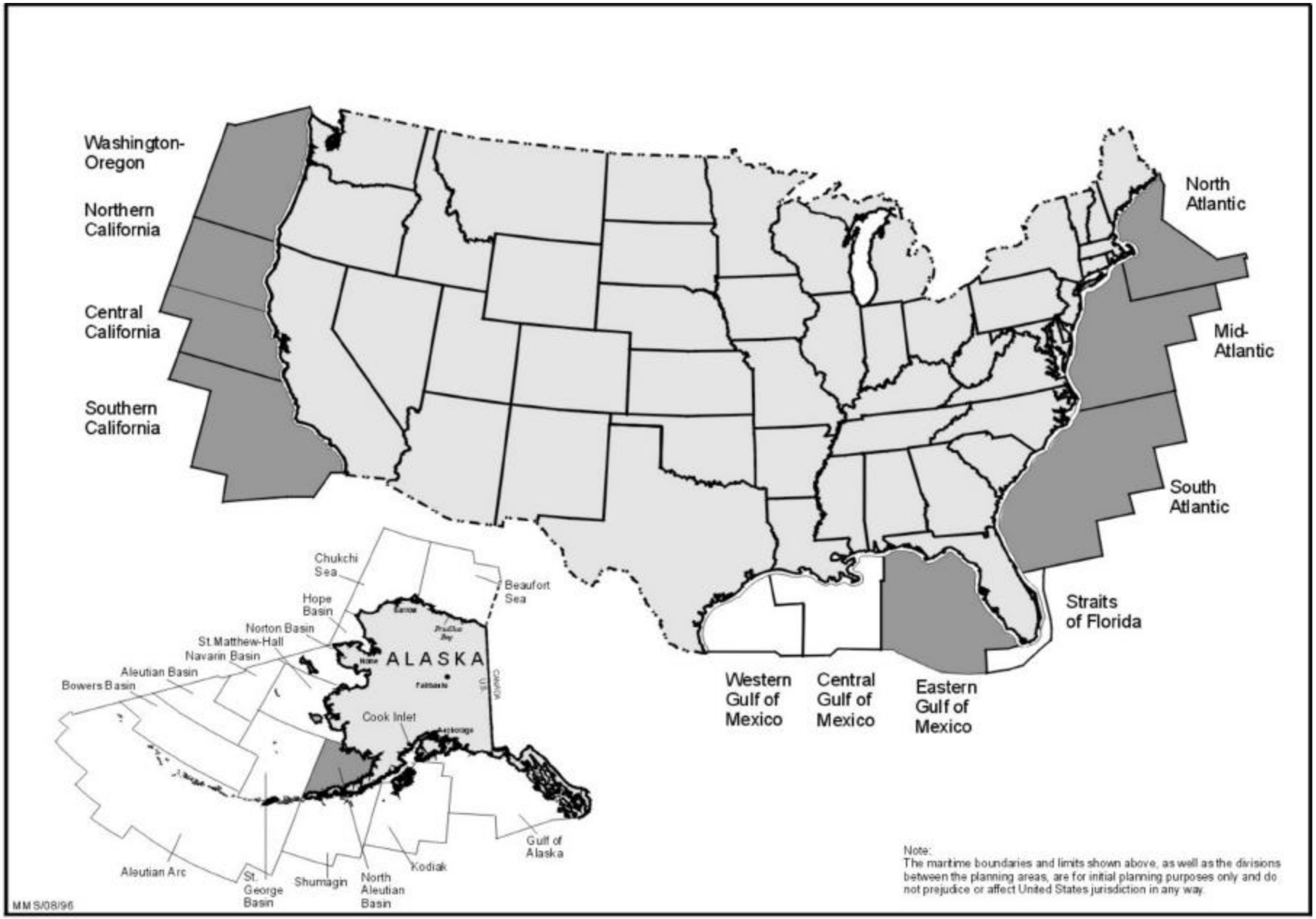

Figure 1. Federal Outer Continental Shelf Planning Areas

Permits, Data Acquisition, and Reimbursement

The permits, issued by the Resource Evaluation (RE) Regional Supervisors, set forth the specific details for each data-gathering activity, which include the area where the data are collected, the timing of the data-gathering activity, approved equipment and methods, and other similar detailed information relevant to each specific permit. The primary source of the G&G data used by the REP is the oil and gas industry, which conducts exploration, development, and production activities on OCS lands. While the MMS does not perform any direct data- collection activities, it does issue permits to industry for collecting prelease G&G data. Lessees and operators are also required by regulations to provide data from their leases to MMS. The MMS has access to the permitted data and information as a condition set forth in the permit. The MMS selectively obtains copies from these activities. Data from prelease permits constitute approximately 90 percent of the MMS database. Reimbursement for data collected by permittees and lessees in their normal conduct of business is for only the cost of data reproduction. However, if industry has collected data in areas not under MMS jurisdiction, such as State waters or adjacent foreign waters, and MMS selects such data, MMS pays the significantly higher "market price" for obtaining such data.

Geophysical Data Surveys

Common Depth Point, Gravity, Magnetic, 3-D, and 4-D Surveys

A large percentage of the geophysical data in the MMS inventory is two-dimensional (2-D) common depth point (CDP) seismic information. Also known as common midpoint or common reflection point data, it is derived from a common location in the ocean subbottom where sound waves originating from various positions of the seismic (sound) source near the ocean surface are reflected back toward the surface. Estimates of the amount of these data in the MMS inventory by planning area are shown in table 1.

Magnetic surveys measure the magnetic field or a component (such as the vertical component) at a series of different locations over an area of interest usually to locate concentrations of magnetic anomalies or to determine depth to basement.

Gravity surveys produce measurements of the gravitational field at a series of different locations over an area of interest. The objective in exploration work is to map density differences that may indicate different rock types. Gravity data usually are displayed as anomaly maps.

While the main use of three-dimensional (3-D) seismic data is still in reservoir development, the evolution of 3-D seismic data and information in conjunction

with interactive computer workstations has made it possible to more closely define and assess the potential for oil and gas occurrence on the OCS, especially with regard to subsalt prospects. The 3-D information is used to delineate, in greater detail than that of traditional 2-D information, subsurface geologic conditions associated with the occurrence of natural gas and oil.

As 3-D seismic technology evolved, the use of 3-D reflection techniques not only portrayed subsurface structure and stratigraphy but revealed information about fluids within the subsurface. Three dimensional seismic surveys that are shot over the same area at different times can detect, where present, changes from one fluid to another, such as oil to water, fluid flows, and pressure changes.

Thus timelapse 3-D seismic surveys, known more commonly as 4-D seismic surveys, have been used to monitor fluid movement in producing reservoirs where changes in fluid content are imaged with seismic techniques over a period of time. Its chief use to date has been reservoir management, such as determining where and how long to drain hydrocarbon-bearing areas and to monitor gas injection or steam or water flooding during enhanced recovery operations.

The proprietary term for geophysical information (i.e., seismic sections, etc.) purchased by MMS is 25 years; for raw geophysical data it is 50 years.

Geological Data Collection

Bottom Sampling and Shallow Coring

Bottom samples are obtained by dropping a weighted tube to the ocean floor and recovering it with an attached wire line; they can also be obtained from dredging. Shallow coring is performed by conventional rotary drilling equipment to obtain a near-surface sample of the rocks of the seabed. The proprietary term for these kinds of geological information is 10 years.

Deep Stratigraphic Tests

A deep stratigraphic test, as defined in 30 CFR 251, means “drilling that involves the penetration into the sea bottom of more than 500 feet (152 meters).” These wells are known as Continental Offshore Stratigraphic Test (COST) wells and are drilled primarily to gather geological information. Conversely, shallow test drilling, as defined in the same regulations, means “drilling into the sea bottom to depths less than those specified in the definition of a deep stratigraphic test.” Three COST wells have encountered hydrocarbons: the COST B-3 (Atlantic), Point Conception No.1 (California), and the Norton COST No. 2 (Alaska). The proprietary term for a COST well is 25 years or, if a lease sale is held in the area, 60 days after the issuance of a lease within 50 geographic miles of the test, whichever is sooner. A discussion of the cost well program is described by Dellagiarino (1991).

G&G Data Release

Regulations

Regulations, promulgated in 1976, require all prelease G&G information acquired by MMS be held proprietary for 25 years and then disclosed to the public. Hence, the first data sets are scheduled to be released in 2001. These data sets are in southern Alaska, Southern California through Washington/Oregon, the Mid- and South-Atlantic planning areas, and in Eastern, Central, and Western Gulf of Mexico areas. Notices on the availability of these data may be found at the Regional links to the MMS homepage at http://www.mms.gov.

Table 1. Summary of Estimates of CDP (2-D) Seismic Miles in MMS Inventory Through FY 2000 by Planning Area (Rounded off to Nearest 1,000 Miles)

Planning Area	Estimated Mileage
Alaska	
Gulf of Alaska	36,000
Cook Inlet	21,000
Kodiak	23,000
Shumagin	10,000
North Aleutian	43,000
St. George Basin	50,000
Aleutian Arc	< 500
Bowers Basin	<1,000
Aleutian Basin	<1,000
St. Matthew-Hall	10,000
Norton Basin	25,000
Navarin Basin	55,000
Hope Basin	9,000
Chukchi Sea	95,000
Beaufort Sea	61,000
Total	440,000
Atlantic	
North Atlantic	69,000
Mid-Atlantic	60,000
South Atlantic	54,000
Straits of Florida	7,000
Total	190,000
Gulf of Mexico	
Eastern GOM	156,000
Central GOM	455,000
Western GOM	354,000
Total	965,000
Pacific	
Southern Calif.	85,000
Central California	21,000
Northern Calif.	19,000
Wash./Oregon	8,000
Total	133,000

Figures may vary by 1-2%.

Table 2. Summary of 2-D Seismic Data Acquisition for FY 1968-2000

FY	Total Miles
1968-1975	269,814
1976	108,922
1977	42,808
1978	54,426
1979	31,489
1980	19,400
1981	69,904
1982	79,961
1983	120,743
1984	89,853
1985	71,521
1986	47,287
1987	113,680
1988	78,920
1989	53,494
1990	85,280
1991	40,513
1992	49,191
1993	25,482
1994	7,138
1995	8,930
1996	33,296
1997	39,682
1998	90,981
1999	30,135
2000	64,710
Total	1,727,560

Figures may vary by 1-2%.

Table 3. Summary of 3-D Seismic Data Acquisition for FY 1968-2000

FY	Total Blocks
1968-1992	0
1993	1,563
1994	1,420
1995	1,826
1996	1,470
1997	3,129
1998	3,460
1999	3,226
2000	6,161
Total	22,255

Figures may vary by 1-2%.

Table 4. Summary of Geological and Geophysical Data Acquisition by Data Type and Region, FY 1968-2000

Data Type	Region	Mileage *
2-D Seismic	Alaska	440,179
	Atlantic	189,858
	Gulf of Mexico	964,682
	Pacific	132,841
	Total	1,727,560
High Resolution	Alaska	59,855
	Atlantic	49,509
	Gulf of Mexico	145,768
	Pacific	30,582
	Total	285,714
CDP Interpretations	Alaska	84,683
	Atlantic	44,801
	Gulf of Mexico	139,418
	Pacific	42,365
	Total	311,267
Gravity and Magnetics	Alaska	370,849
	Atlantic	15,783
	Gulf of Mexico	590,331
	Pacific	110,150
	Total	1,087,113
3-D Seismic	Alaska	22
	Atlantic	0
	Gulf of Mexico	22,181
	Pacific	52
	Total	22,255
Deep Stratigraphic Tests	Alaska	14
	Atlantic	5
	Gulf of Mexico	3
	Pacific	2
	Total	24

*3-D seismic is measured in blocks and Deep Stratigraphic Test units are wells drilled.
bl = Blocks

Figures may vary 1-2%.

Table 5. Total Number of Permits Issued for Geological and Geophysical Exploration

Year	A	B	C	D	E	F	G
1960-1968	2,353	---	---	---	---	---	---
1969	258	249	9	0	0	0	0
1970	213	203	10	0	0	0	0
1971	210	205	5	0	0	0	0
1972	220	210	10	0	0	0	0
1973	339	321	18	0	0	0	0
1974	357	345	12	2	0	0	0
1975	510	487	23	3	0	0	0
1976	420	400	20	7	0	0	0
1977	452	436	16	4	0	0	0
1978	342	329	13	2	0	0	0
1979	276	265	11	0	0	0	0
1980	318	302	16	1	0	0	0
1981	394	383	11	0	0	0	0
1982	502	490	12	3	0	0	0
1983	574	542	32	1	16	0	0
1984	543	518	25	0	18	0	0
1985	398	382	16	0	38	0	0
1986	211	207	4	0	32	0	0
1987	298	282	16	0	42	0	0
1988	313	289	24	0	45	0	0
1989	249	237	12	1	47	0	0
1990	251	241	9	0	57	1	0
1991	170	156	12	0	45	2	0
1992	141	137	3	0	53	1	0
1993	147	135	11	0	70	1	0
1994	133	117	16	0	53	0	0
1995	104	92	11	0	50	1	0
1996	136	120	16	0	59	0	0
1997	159	139	20	0	69	0	1
1998	157	143	14	0	59	0	1
1999	111	98	13	0	44	0	0
2000	79	73	6	0	32	2	0
Total	11,338	8,533	446	24	829	8	2

A=Total Number of Geological, Geophysical, and Strategic Minerals Permits
B=Number of Geophysical Permits
C=Number of Geological Permits
D=Number of Geological Permits Issued for Deep Stratigraphic Tests
E=Number of Geophysical Permits Issued for 3-D Seismic Data
F=Number of Permits Issued for Strategic (Nonenergy) Minerals
G=Number of Permits Issued for 4-D Seismic Data
Dashed lines=Individual breakouts not established

Figures may vary 1-2%.

Table 6. Summary of Total Annual Expenditures by MMS for Geological and Geophysical Data Acquisition by Region, FY 1968-2000 (in dollars)

FY	Alaska	Atlantic	Gulf of Mexico	Pacific	Total
1968-1975	3,162,548	361,686	9,414,042	1,443,987	14,891,780*
1976	3,496,607	2,504,710	3,281,698	581,670	9,914,882*
1977	450,161	2,287,390	3,764,678	1,147,968	7,719,974*
1978	3,421,269	906,989	1,842,701	416,463	6,587,422
1979	6,240,687	232,085	1,573,094	2,272,407	11,020,298*
1980	6,972,885	4,469,762	4,388,508	1,412,062	17,243,217
1981	6,842,045	1,530,898	1,168,618	866,656	10,408,217
1982	1,864,661	1,945,270	2,943,602	1,996,271	8,749,804
1983	5,673,514	1,738,427	3,802,409	1,312,596	12,526,946
1984	4,751,354	1,580,008	4,246,742	1,286,598	11,864,702
1985	3,676,375	318,261	2,959,989	861,687	7,816,312
1986	2,904,246	87,307	1,834,553	363,564	5,189,670
1987	2,579,190	438,792	1,840,609	939,558	5,798,149
1988	1,382,560	71,510	1,078,713	114,168	2,646,951
1989	389,960	259,629	913,481	96,354	1,659,424
1990	886,402	150	865,083	0	1,751,635
1991	539,986	2,790	1,003,066	31,000	1,576,842
1992	99,797	1,932	794,104	0	1,490,798**
1993	322,410	0	1,014,853	26,700	1,363,963
1994	582,132	0	760,245	11,806	1,454,183**
1995	379,395	0	628,752	21,125	1,142,817**
1996	283,764	0	1,697,494	40,867	2,022,125
1997	204,655	0	1,180,893	19,594	1,471,967**
1998	278,606	0	1,804,694	10,264	2,094,400**
1999	543,775	0	1,400,781	13,350	1,957,906
2000	354,448	0	2,053,285	7,148	2,414,881***
Total	58,283,432	18,737,596	58,256,687	15,293,863	152,779,265

*Included in the budget for these years were General Account funds that were transferred to the U.S. Geological Survey, Branch of Marine Geology, for G&G data acquisition. These accounts included $509,517 in the interval between FY 1968-1975, $50,197 in FY 1976, $69,777 in FY 1977, and $702,025 in FY 1979.

**Included in the budget for these years were funds that were used for special projects related to G&G activities. In FY 1992, $494,965 was obligated toward the purchase of geologic interpretive workstations and $100,000 was obligated toward the initiation of the Offshore Northern Gulf of Mexico Oil and Gas Atlas Series. In FY 1994, $100,000 was again obligated toward the preparation of the Offshore Northern Gulf of Mexico Oil and Gas Atlas and in FY 1995, $100,000 was obligated toward the completion of the Atlas, and $13,545 was obligated toward finalization of a well log data conversion contract in the Gulf of Mexico. In FY 1997, $5,000 was obligated towards the curation of Atlantic well samples. In FY 1998, $836 was obligated toward updating the MMS AAPG CD-ROM investment. All figures have been rounded.

***Includes $353,111 carried over by the Gulf of Mexico from 1999.

Figures may vary 1-2%.

Table 7. Summary of Geological and Geophysical Data Acquisition Expenditures by Data Type and Region, FY 1968-2000

Data Type	Expenditures ($)*
Alaska	
2-D Seismic	40,944,258
High Resolution	11,125,798
CDP Interpretations	439,793
Gravity and Magnetics	1,026,956
3-D Seismic	706,228
Total	54,243,033
Atlantic	
2-D Seismic	7,791,438
High Resolution	9,751,232
CDP Interpretations	55,274
Gravity and Magnetics	2,902
3-D Seismic	0
Total	17,600,846
Gulf of Mexico	
2-D Seismic	31,281,929
High Resolution	12,729,139
CDP Interpretations	856,526
Gravity and Magnetics	539,804
3-D Seismic	7,714,632
Total	53,122,030
Pacific	
2-D Seismic	9,553,194
High Resolution	3,696,394
CDP Interpretations	72,175
Gravity and Magnetics	534,363
3-D Seismic	27,925
Total	13,884,051

*MMS has had additional expenditures through its G&G data acquisition budget for other general purchases such as field tapes, special processing, navigation tapes, interpretive hardware and software for evaluation purposes, geological studies, and acquisition of digital tapes of in-house analog data.

Figures may vary 1-2%.

Table 8. Summary of Average Cost Per Mile by MMS for 2-D Seismic Data, FY 1968-2000

FY	Average Cost ($/Mile)
1968-1975	33.60
1976	34.90
1977	30.00
1978	73.60
1979	99.70
1980	91.50
1981	100.70
1982	107.00
1983	102.50
1984	121.10
1985	105.90
1986	102.00
1987	48.30
1988	32.70
1989	26.10
1990	18.00
1991	19.86
1992	7.49
1993	13.33
1994	75.84
1995	22.02
1996	39.04
1997	5.45
1998	3.18
1999	1.40
2000	1.29

Note: Totals reflect average cost per mile for all CDP Information acquired, both State and Federal. Average costs reflect only those dollars assigned to the bureauwide G&G budget and do not reflect monies allocated from Regional funds.

Figures may vary 1-2%.

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Appendix

Alaska

Atlantic

Gulf of Mexico

Pacific

Alaska Tables

Table A-1. Summary of Geological and Geophysical Data Acquisition by Fiscal Year for Alaska

Year	2-D	HRD	Interpretations	Grav/Mag	3-D	DST
1968-1975	70,306	5,500	32,819	55,710	0	1
1976	37,785	19,163	30,164	0	0	4
1977	11,952	5,606	21,700	23,470	0	4
1978	28,524	0	0	36,625	0	0
1979	8,538	5,412	0	25,465	0	0
1980	10,109	7,703	0	0	0	1
1981	35,430	4,590	0	14,969	0	0
1982	16,624	0	0	0	0	2
1983	51,903	0	0	0	0	2
1984	30,961	7,904	0	5,850	0	0
1985	30,270	0	0	0	0	0
1986	21,603	1,600	0	0	0	0
1987	49,532	470	0	80,826	0	0
1988	14,963	1,741	0	0	0	0
1989	3,136	166	0	9,543	0	0
1990	8,557	0	0	11,046	0	0
1991	3,964	0	0	1,500	0	0
1992	0	0	0	0	0	0
1993	1,893	0	0	0	0	0
1994	2,422	0	0	102,845	0	0
1995	737	0	0	3,000	0	0
1996	315	0	0	0	0	0
1997	382	0	0	0	3*	0
1998	273	0	0	0	0	0
1999	0	0	0	0	7*	0
2000	0	0	0	0	12*	0
Total	440,179	59,855	84,683	370,849	22*	14

Note: *Acquisition for 3-D seismic data are measured in blocks; all other acquisitions in this table are measured in miles. DST dates are assigned based upon completion dates and are measured in terms of wells completed. All other data are measured in terms of miles.

Table A-2. Number of Permits Issued for Geological and Geophysical Exploration in Alaska

Year	A	B	C	D	E	F
1960-1968	75	---	---	---	---	---
1969	31	28	3	0	0	0
1970	40	36	4	0	0	0
1971	27	26	1	0	0	0
1972	17	17	0	0	0	0
1973	33	32	1	0	0	0
1974	47	44	3	0	0	0
1975	82	74	8	1	0	0
1976	69	61	8	4	0	0
1977	33	29	4	4	0	0
1978	9	8	1	0	0	0
1979	32	30	2	0	0	0
1980	41	36	5	1	0	0
1981	54	49	5	0	0	0
1982	85	79	6	3	0	0
1983	103	80	23	1	0	0
1984	70	62	8	0	0	0
1985	63	56	7	0	0	0
1986	18	17	1	0	0	0
1987	18	14	4	0	0	0
1988	13	9	4	0	0	0
1989	17	14	3	0	0	0
1990	19	15	3	0	0	1
1991	7	4	1	0	0	2
1992	7	6	0	0	0	1
1993	11	10	0	0	2	1
1994	3	3	0	0	1	0
1995	1	1	0	0	1	0
1996	6	6	0	0	5	0
1997	5	4	1	0	0	0
1998	2	2	0	0	2	0
1999	2	2	0	0	2	0
2000	1	1	0	0	1	0
Total	1,041	855	106	14	14	5

A=Total Number of Geological, Geophysical, and Strategic Minerals Permits
B=Number of Geophysical Permits
C=Number of Geological Permits
D=Number of Geological Permits Issued for Deep Stratigraphic Tests
E=Number of Geophysical Permits Issued for 3-D Seismic Data
F=Number of Permits Issued for Strategic (Nonenergy) Minerals
Dashed lines=Individual breakouts not established

Table A-3. Summary of Expenditures by MMS for Geological and Geophysical Data Acquisition by Fiscal Year for Alaska (in dollars)

Year	2-D	HRD	Interpretations	Grav/Mag	3-D	DST
1968-1975	2,803,939	119,700	160,832	7,515	0	NA
1976	1,628,153	1,598,789	268,961	0	0	NA
1977	271,035	36,473	10,000	49,450	0	NA
1978	2,956,280	0	0	408,679	0	0
1979	2,180,700	2,019,512	0	125,148	0	0
1980	1,086,423	5,789,936	0	0	0	NA
1981	5,231,130	1,531,458	0	69,286	0	0
1982	1,817,736	0	0	0	0	NA
1983	5,673,514	0	0	0	0	NA
1984	4,118,626	19,238	0	27,072	0	0
1985	3,669,129	0	0	0	0	0
1986	2,780,556	950	0	0	0	0
1987	2,301,780	400	0	249,951	0	0
1988	1,339,007	3,425	0	0	0	0
1989	347,872	5,917	0	21,851	0	0
1990	832,476	0	0	51,681	0	0
1991	518,613	0	0	15,573	0	0
1992*	0	0	0	0	0	0
1993	139,117	0	0	0	0	0
1994	579,129	0	0	0	0	0
1995	167,170	0	0	750	0	0
1996	113,071	0	0	0	0	0
1997	195,855	0	0	0	0	0
1998	192,947	0	0	0	0	0
1999	0	0	0	0	358,15	0
2000	0	0	0	0	348,07	0
Total	40,944,258	11,125,798	439,793	1,026,956	706,22	---

*In FY 1992, the Alaska Region spent funds from the G&G budget and Regional funds to acquire digital copies of data already in their inventory and did not acquire any new or additional data.

Note: NA represents “not applicable” as no G&G funds are used to acquire information from a DST. Where no DST was completed, a zero is entered into the expenditure column.

Table A-4. Summary of Average Cost Per Mile by MMS for 2-D Seismic Data by Fiscal Year for Alaska (in dollars)

Year	Average Cost ($/Mile)
1968-1975	39.88
1976	43.09
1977	22.68
1978	103.64
1979	255.41
1980	107.47
1981	147.65
1982	109.34
1983	109.31
1984	133.03
1985	121.21
1986	128.71
1987	46.47
1988	89.49
1989	110.93
1990	97.29
1991	130.85
1992	0
1993	73.48
1994	239.18
1995	475.85
1996	358.96
1997	512.71
1998	706.77
1999	0
2000	0

Note: Totals reflect average cost per mile for all CDP Information acquired, both State and Federal. Average costs reflect only those dollars assigned to the bureauwide G&G budget and do not reflect monies allocated from Regional funds.

Zero indicates G&G dollars were not spent on CDP information.

Atlantic Tables

Table A-5. Summary of Geological and Geophysical Data Acquisition by Fiscal Year for the Atlantic

Year	2-D	HRD	Interpretations	Grav/Mag	3-D	DST
1968-1975	41,958	1,740	11,802	14,267	0	0
1976	25,211	23,867	29,822	1,076	0	2
1977	21,032	6,100	3,177	440	0	2
1978	14,281	0	0	0	0	0
1979	6,877	0	0	0	0	1
1980	585	10,660	0	0	0	0
1981	9,950	7,142	0	0	0	0
1982	19,074	0	0	0	0	0
1983	30,077	0	0	0	0	0
1984	9,386	0	0	0	0	0
1985	1,640	0	0	0	0	0
1986	424	0	0	0	0	0
1987	2,356	0	0	0	0	0
1988	827	0	0	0	0	0
1989	2,730	0	0	0	0	0
1990	31	0	0	0	0	0
1991	1,042	0	0	0	0	0
1992	2,377	0	0	0	0	0
1993	0	0	0	0	0	0
1994	0	0	0	0	0	0
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
Total	189,858	49,509	44,801	15,783	0	5

Note: DST dates are assigned based upon completion dates and are measured in terms of wells completed. All other data are measured in terms of miles.

Table A-6. Number of Permits Issued for Geological and Geophysical Exploration in the Atlantic

Year	A	B	C	D	E	F
1960-1968	45	---	---	---	---	---
1969	7	7	0	0	0	0
1970	4	3	1	0	0	0
1971	4	4	0	0	0	0
1972	4	4	0	0	0	0
1973	4	4	0	0	0	0
1974	2	2	0	0	0	0
1975	29	23	6	1	0	0
1976	35	28	7	3	0	0
1977	20	20	0	0	0	0
1978	17	13	4	1	0	0
1979	9	9	0	0	0	0
1980	15	15	0	0	0	0
1981	17	16	1	0	0	0
1982	11	11	0	0	0	0
1983	10	10	0	0	0	0
1984	6	6	0	0	0	0
1985	2	1	1	0	0	0
1986	3	2	1	0	0	0
1987	2	0	2	0	0	0
1988	4	4	0	0	0	0
1989	0	0	0	0	0	0
1990	1	1	0	0	0	0
1991	0	0	0	0	0	0
1992	0	0	0	0	0	0
1993	0	0	0	0	0	0
1994	0	0	0	0	0	0
1995	1	0	0	0	0	1
1996	0	0	0	0	0	0
1997	2	1	1	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	1	0	1	0	0	1
Total	255	184	25	5	0	2

A=Total Number of Geological, Geophysical, and Strategic Minerals Permits
B=Number of Geophysical Permits
C=Number of Geological Permits
D=Number of Geological Permits Issued for Deep Stratigraphic Tests
E=Number of Geophysical Permits Issued for 3-D Seismic Data
F=Number of Permits Issued for Strategic (Nonenergy) Minerals
Dashed lines=Individual breakouts not established

Table A-7. Summary of Expenditures by MMS for Geological and Geophysical Data Acquisition by Fiscal Year for the Atlantic (in dollars)

Year	2-D	HRD	Interpretations	Grav/Mag	3-D	DST
1968-1975	309,029	4,900	---	---	0	0
1976	196,687	2,256,167	45,282	2,902	0	NA
1977	242,868	1,968,513	9,992	0	0	NA
1978	581,562	0	0	0	0	0
1979	119,250	0	0	0	0	NA
1980	51,096	4,278,448	0	0	0	0
1981	179,682	1,243,204	0	0	0	0
1982	1,882,723	0	0	0	0	0
1983	1,718,584	0	0	0	0	0
1984	1,500,298	0	0	0	0	0
1985	287,135	0	0	0	0	0
1986	87,307	0	0	0	0	0
1987	438,792	0	0	0	0	0
1988	71,510	0	0	0	0	0
1989	120,042	0	0	0	0	0
1990	150	0	0	0	0	0
1991	2,790	0	0	0	0	0
1992	1,933	0	0	0	0	0
1993	0	0	0	0	0	0
1994	0	0	0	0	0	0
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
Total	7,791,438	9,751,232	55,274	2,902	0	---

Note: NA represents “not applicable” as no G&G funds are used to acquire information from a DST. Where no DST was completed, a zero is entered into the expenditure column.

No expenditures are available for CDP interpretations or gravity and magnetic data for 1968-1975.

Table A-8. Summary of Average Cost Per Mile by MMS for 2-D Seismic Data by Fiscal Year for the Atlantic (in dollars)

Year	Average Cost ($/Mile)
1968-1975	7.37
1976	7.80
1977	11.55
1978	40.72
1979	17.34
1980	87.34
1981	18.06
1982	98.70
1983	57.14
1984	159.85
1985	175.08
1986	205.91
1987	186.24
1988	86.47
1989	43.97
1990	4.84
1991	2.68
1992	0.81
1993	---
1994	---
1995	---
1996	---
1997	---
1998	---
1999	---
2000	---

Note: Totals reflect average cost per mile for all CDP Information acquired, both State and Federal. Average costs reflect only those dollars assigned to the bureauwide G&G budget and do not reflect monies allocated from Regional funds.

Dashed lines indicate no funding for that year.

Gulf of Mexico Tables

Table A-9. Summary of Geological and Geophysical Data Acquisition by Fiscal Year for the Gulf of Mexico

Year	2-D	HRD	Interpretations	Grav/Mag	3-D	DST
1968-1975	143,458	88,549	120,038	19,670	0	2
1976	31,474	9,367	19,380	56,272	0	0
1977	4,485	18,119	0	0	0	0
1978	7,188	8,275	0	0	0	0
1979	11,681	5,018	0	0	0	0
1980	4,758	15,940	0	0	0	0
1981	16,454	500	0	0	0	0
1982	28,700	0	0	0	0	0
1983	26,290	0	0	0	0	0
1984	40,828	0	0	0	0	0
1985	31,430	0	0	0	0	0
1986	22,616	0	0	0	0	0
1987	43,073	0	0	0	0	0
1988	56,265	0	0	0	0	0
1989	43,121	0	0	0	0	1
1990	76,692	0	0	0	0	0
1991	35,507	0	0	0	0	0
1992	46,814	0	0	0	0	0
1993	23,589	0	0	0	1,563*	0
1994	4,416	0	0	0	1,420*	0
1995	8,193	0	0	0	1,826*	0
1996	32,797	0	0	0	1,458*	0
1997	39,300	0	0	0	3,105*	0
1998	90,708	0	0	178,305	3,452*	0
1999	30,135	0	0	52,000	3,219*	0
2000	64,710	0	0	284,084	6,138*	0
Total	964,682	145,768	139,418	590,331	22,181*	3

Note: *Acquisitions for 3-D seismic data are measured in blocks; all other acquisitions in this table are measured in miles.

DST dates are assigned based upon completion dates and are measured in terms of wells completed.

Figures may vary by 1-2%.

Table A-10. Number of Permits Issued for Geological and Geophysical Exploration in the Gulf of Mexico

Year	A	B	C	D	E	F	G
1960-1968	2,071	---	---	---	---	---	---
1969	207	204	3	0	0	0	0
1970	166	162	4	0	0	0	0
1971	179	175	4	0	0	0	0
1972	198	188	10	0	0	0	0
1973	272	264	8	0	0	0	0
1974	284	275	9	2	0	0	0
1975	353	348	5	0	0	0	0
1976	292	289	3	0	0	0	0
1977	368	361	7	0	0	0	0
1978	278	278	0	0	0	0	0
1979	211	204	7	0	0	0	0
1980	231	225	6	0	0	0	0
1981	283	280	3	0	0	0	0
1982	344	341	3	0	0	0	0
1983	416	416	0	0	16	0	0
1984	411	408	3	0	18	0	0
1985	300	295	5	0	38	0	0
1986	170	169	1	0	32	0	0
1987	258	252	6	0	42	0	0
1988	263	251	12	0	45	0	0
1989	232	223	9	1	47	0	0
1990	227	222	5	0	57	0	0
1991	163	152	11	0	45	0	0
1992	134	131	3	0	53	0	0
1993	136	125	11	0	68	0	0
1994	130	114	16	0	52	0	0
1995	102	91	11	0	49	0	0
1996	130	114	16	0	54	0	0
1997	152	134	18	0	69	0	1
1998	155	141	14	0	57	0	1
1999	109	96	13	0	42	0	0
2000	77	72	5	0	31	1	0
Total	9,302	7,000	231	3	815	1	2

A=Total Number of Geological, Geophysical, and Strategic Minerals Permits
B=Number of Geophysical Permits
C=Number of Geological Permits
D=Number of Geological Permits Issued for Deep Stratigraphic Tests
E=Number of Geophysical Permits Issued for 3-D Seismic Data
F=Number of Permits Issued for Strategic (Nonenergy) Minerals
G=Number of Permits Issued for 4-D Seismic Data
Dashed lines=Individual breakouts not established

Figures may vary by 1-2%.

Table A-11. Summary of Expenditures by MMS for Geological and Geophysical Data Acquisition by Fiscal Year for the Gulf of Mexico (in dollars)

Year	2-D	HRD	Interpretations	Grav/Mag	3-D	DST
1968-1975	5,255,068	2,795,562	722,442	129,500	0	NA
1976	1,489,665	514,141	134,084	385,234	0	0
1977	579,583	3,072,088	0	0	0	0
1978	330,183	1,438,856	0	0	0	0
1979	492,299	949,697	0	0	0	0
1980	388,329	3,926,990	0	0	0	0
1981	939,506	31,805	0	0	0	0
1982	2,936,727	0	0	0	0	0
1983	3,678,684	0	0	0	0	0
1984	3,999,326	0	0	0	0	0
1985	2,768,574	0	0	0	0	0
1986	1,600,031	0	0	0	0	0
1987	1,824,927	0	0	0	0	0
1988	1,075,515	0	0	0	0	0
1989	885,748	0	0	0	0	NA
1990	704,670	0	0	0	0	0
1991	289,266	0	0	0	0	0
1992	376,893	0	0	0	0	0
1993	200,407	0	0	0	537,908	0
1994	26,946	0	0	0	647,592	0
1995	21,535	0	0	0	592,223	0
1996	1,151,587	0	0	0	526,471	0
1997	44,103	0	0	0	1,150,050	0
1998	96,771	0	0	12,000	1,289,773	0
1999*	42,227	0	0	3,000	1,154,577	0
2000	83,359	0	0	10,070	1,816,038	0
Total	31,281,929	12,729,139	856,526	539,804	7,714,632	---

Note: NA represents “not applicable” as no G&G funds are used to acquire information from a DST. Where no DST was completed, a zero is entered into the expenditure column.

*In FY 1999, the Gulf of Mexico Region also spent funds to acquire digital copies of data and information that were already in their inventory or purchased as two differing displays.

Figures may vary by 1-2%.

Table A-12. Summary of Average Cost Per Mile by MMS for 2-D Seismic Data by Fiscal Year for the Gulf of Mexico (in dollars)

Year	Average Cost ($/Mile)
1968-1975	36.63
1976	47.33
1977	129.23
1978	45.94
1979	42.15
1980	81.62
1981	57.10
1982	102.33
1983	139.93
1984	97.96
1985	88.09
1986	70.75
1987	42.37
1988	19.12
1989	20.54
1990	9.19
1991	8.14
1992	8.05
1993	8.49
1994	6.10
1995	2.63
1996	35.11
1997	1.01
1998	1.07
1999	1.40
2000	1.29

Note: Totals reflect average cost per mile for all CDP Information acquired, both State and Federal. Average costs reflect only those dollars assigned to the bureauwide G&G budget and do not reflect monies allocated from Regional funds.

Figures may vary by 1-2-%.

Pacific Tables

Table A-13. Summary of Geological and Geophysical Data Acquisition by Fiscal Year for the Pacific

Year	2-D	HRD	Interpretations	Grav/Mag	3-D	DST
1968-1975	14,092	9,971	15,552	87,637	0	1
1976	14,452	2,429	2,288	1,851	0	0
1977	5,339	5,979	24,525	3,950	0	0
1978	4,433	1,155	0	0	0	1
1979	4,393	6,578	0	0	0	0
1980	3,948	4,470	0	0	0	0
1981	8,070	0	0	3,662	0	0
1982	15,563	0	0	13,050	0	0
1983	12,473	0	0	0	0	0
1984	8,678	0	0	0	0	0
1985	8,181	0	0	0	0	0
1986	2,644	0	0	0	0	0
1987	18,719	0	0	0	0	0
1988	6,865	0	0	0	0	0
1989	4,507	0	0	0	0	0
1990	0	0	0	0	0	0
1991	0	0	0	0	0	0
1992	0	0	0	0	0	0
1993	0	0	0	0	0	0
1994	300	0	0	0	0	0
1995	0	0	0	0	0	0
1996	184	0	0	0	12*	0
1997	0	0	0	0	21*	0
1998	0	0	0	0	8*	0
1999	0	0	0	0	0	0
2000	0	0	0	0	11*	0
Total	132,841	30,582	42,365	110,150	52*	2

Note: *Acquisitions for 3-D seismic data are measured in blocks; all other acquisitions in this table are measured in miles.

DST dates are assigned based upon completion dates and are measured in terms of wells completed.

Table A-14. Number of Permits Issued for Geological and Geophysical Exploration in the Pacific

Year	A	B	C	D	E	F
1960-1968	162	---	---	---	---	---
1969	13	10	3	0	0	0
1970	3	2	1	0	0	0
1971	0	0	0	0	0	0
1972	1	1	0	0	0	0
1973	30	21	9	0	0	0
1974	24	24	0	0	0	0
1975	46	42	4	1	0	0
1976	24	22	2	0	0	0
1977	31	26	5	0	0	0
1978	38	30	8	1	0	0
1979	24	22	2	0	0	0
1980	31	26	5	0	0	0
1981	40	38	2	0	0	0
1982	62	59	3	0	0	0
1983	45	36	9	0	0	0
1984	56	42	14	0	0	0
1985	33	30	3	0	0	0
1986	20	19	1	0	0	0
1987	20	16	4	0	0	0
1988	33	25	8	0	0	0
1989	0	0	0	0	0	0
1990	4	3	1	0	0	0
1991	0	0	0	0	0	0
1992	0	0	0	0	0	0
1993	0	0	0	0	0	0
1994	0	0	0	0	0	0
1995	0	0	0	0	0	0
1996	0	0	0	0	0	0
1997	0	0	0	0	0	0
1998	0	0	0	0	0	0
1999	0	0	0	0	0	0
2000	0	0	0	0	0	0
Total	740	494	84	2	0	0

A=Total Number of Geological, Geophysical, and Strategic Minerals Permits
B=Number of Geophysical Permits
C=Number of Geological Permits
D=Number of Geological Permits Issued for Deep Stratigraphic Tests
E=Number of Geophysical Permits Issued for 3-D Seismic Data
F=Number of Permits Issued for Strategic (Nonenergy) Minerals
Dashed lines=Individual breakouts not established

Table A-15. Summary of Expenditures by MMS for Geological and Geophysical Data Acquisition by Fiscal Year for the Pacific (in dollars)

Year	2-D	HRD	Interpretations	Grav/Mag	3-D	DST
1968-1975	697,733	175,000	49,617	415,913	0	NA
1976	486,139	57,660	20,596	17,275	0	0
1977	188,930	752,400	1,962	11,796	0	0
1978	137,754	23,685	0	0	0	NA
1979	346,612	1,588,695	0	0	0	0
1980	249,048	1,098,954	0	0	0	0
1981	689,372	0	0	20,029	0	0
1982	1,918,891	0	0	69,350	0	0
1983	1,309,608	0	0	0	0	0
1984	1,262,030	0	0	0	0	0
1985	848,777	0	0	0	0	0
1986	356,700	0	0	0	0	0
1987	921,422	0	0	0	0	0
1988	93,748	0	0	0	0	0
1989	44,273	0	0	0	0	0
1990	0	0	0	0	0	0
1991	0	0	0	0	0	0
1992	0	0	0	0	0	0
1993	0	0	0	0	0	0
1994	443	0	0	0	0	0
1995	0	0	0	0	0	0
1996	1,714	0	0	0	10,452	0
1997	0	0	0	0	13,479	0
1998	0	0	0	0	3,344	0
1999*	0	0	0	0	0	0
2000	0	0	0	0	650	0
Total	9,553,194	3,696,394	72,175	534,363	27,925	---

Note: NA represents “not applicable” as no G&G funds are used to acquire information from a DST. Where no DST was completed, a zero is entered into the expenditure column.

*In FY 1999, the Pacific Region spent funds to acquire digital copies of data already in their inventory and did not acquire any new or additional data.

Table A-16. Summary of Average Cost Per Mile by MMS for 2-D Seismic Data by Fiscal Year for the Pacific (in dollars)

Year	Average Cost ($/Mile)
1968-1975	49.51
1976	33.64
1977	35.39
1978	31.08
1979	78.90
1980	63.08
1981	85.42
1982	123.30
1983	105.00
1984	145.43
1985	103.75
1986	134.91
1987	49.22
1988	13.66
1989	9.82
1990	0
1991	0
1992	---
1993	0
1994	1.48
1995	0
1996	9.32
1997	0
1998	0
1999	0
2000	0

Note: Totals reflect average cost per mile for all CDP Information acquired, both State and Federal. Average costs reflect only those dollars assigned to the bureauwide G&G budget and do not reflect monies allocated from Regional funds.

Dashed line indicates no funding for that year. Zero indicates G&G dollars were not spent on CDP information.

Glossary

Block - a geographically defined section of the Outer Continental Shelf (OCS) designated by a number on an Official Protraction Diagram or Leasing Map prepared by the Minerals Management Service (MMS). A block normally is a 9-square-mile area (3 miles x 3 miles) consisting of 5,760 acres. A single block is the smallest unit that can be leased for oil and gas exploration on the OCS.

Common Depth Point - a common location in the ocean subbottom where sound waves originating from various positions of the seismic (sound) source near the ocean surface are reflected back toward the surface. The traces from different seismic profiles corresponding to the same reflection point are mathematically summed (stacked) for reflection points beneath the survey line. Also known as common midpoint or common reflection point.

COST Wells - Continental Offshore Stratigraphic Test Wells - deep stratigraphic wells drilled to determine the geological character or stratigraphy of rock strata. These wells, which may be more than 20,000 feet deep, provide information that can be used by Government and industry to evaluate tracts to be offered in a lease sale.

Fair Market Value - the amount in cash, or on terms reasonably equivalent to cash, for which in all probability the property would be sold by a knowledgeable purchaser who desired, but is not obligated, to buy. This market value that is sought is not merely theoretical or hypothetical but represents, insofar as it is possible to estimate, the actual selling price.

High-Resolution - a range of seismic frequencies above the normal range of frequencies used in exploration, with an improvement in resolution in the shallow portions of the subbottom but with less total penetration into the subbottom.

Lease - any form of authorization that is used under section 8 or maintained under section 6 of the Outer Continental Shelf Lands Act and that authorizes exploration for and development and production of minerals or the area covered by that authorization, whichever is required of the context.

Lease Sale - an MMS proceeding by which leases for certain OCS tracts are offered for sale by competitive bidding and during which bids are received, publicly announced, and recorded.

Outer Continental Shelf - all submerged lands lying seaward and outside of the area of lands beneath navigable waters as defined in section 2 of the Submerged Lands Act and of which the subsoil and seabed appertain to the United States and are subject to its jurisdiction and control.

Outer Continental Shelf Lands Act - law passed by Congress on August 7, 1953, and amended in 1975, 1978, and 1985.

Permit - the contract or agreement, other than a lease, approved for a specified period of not more than 1 year under which a person acquires the right to conduct (1) geological exploration for mineral resources, (2) geophysical exploration for mineral resources, (3) geological scientific research, or (4) geophysical scientific research.

Planning Area - a subdivision of an offshore area used as the initial basis for considering blocks to be offered for lease in the DOI's offshore oil and gas leasing program.

Shallow Hazards - potential geological and manmade hazards to exploration, development, and production, on the OCS that are in the shallow portion of the subbottom. Examples include seismicity, active faults, shallow gas deposits, steep slopes, unstable soil conditions, pipelines, anchors, and sunken ships. Shallow hazards may occur in shallow or deep waters.

The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Minerals Revenue Management** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.